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SCHEDULED ITEM

TO: HONORABLE CHAIRPERSON AND MEMBERS OF THE AZUSA UTILITY BOARD

FROM: GEORGE F. MORROW, DIRECTOR OF UTILITIES

DATE: SEPTEMBER 22, 2014

SUBJECT: REPORT AND RECOMMENDATION PURSUANT TO CALIFORNIA ASSEMBLY BILL 2514 ON ESTABLISHING ENERGY STORAGE TARGETS

RECOMMENDATION

It is recommended that the Utility Board accept the attached Energy Storage Report and adopt Resolution No. UB-12-14 providing that the energy storage targets for Azusa Light & Water for December 31, 2016 and December 31, 2021 are set at zero.

BACKGROUND

In 2010, Assembly Bill 2514 (AB 2514), the Energy Storage Bill, was signed into law by Governor Schwarzenegger. AB 2514 requires all electric load serving entities in California to undertake a study of applicability of energy storing technologies and, if cost effective, set goals for procuring or installing such technologies. (Note that there are "special" exemptions: 1) corporations serving fewer than 60,000 accounts and 2) public utility districts receiving all their power pursuant to preferences stemming from the Federal Trinity River Division Act.)

The energy storage concept is not new and historically it included technologies such as pumped hydro, batteries, flywheels, capacitors, thermal storage devices etc. The expected operational benefits of such technologies are thought to be demand shifting, peak shaving, frequency regulation, mitigation of the variability of renewable generators such as PV solar and wind, reduction of emissions and greenhouse gases, and reductions in distribution and transmission expenditures.

AB 2514 requires that jurisdictional regulators -- the California Public Utilities Commission (CPUC) for Investor Owned Utilities (IOU), Community Choice Aggregation (CCA) and Electric Service Providers (ESP) and local Utility Boards/Councils for the Publicly Owned Utilities (POU) -- initiate by March 1, 2012, a study of potential installations/procurement of energy storage devices by 12/31/2016 and 12/31/2021. In the case of POUs, the findings of said studies, along with established year 2016 and 2021 targets, if any, must be reported to the Utility

Board and the California Energy Commission (CEC) by 10/1/2014. Any established 2016 and 2021 targets need to be reviewed and, if needed, updated every three (3) years and their achievement reported to the Utility Board and the CEC by 1/1/2017 and 1/1/2022, respectively.

It is important to emphasize that pertinent Section 2836.6 of the Public Utilities Code states: "All procurement of energy storage systems by load-serving entity or local publicly owned electric utility *shall be cost effective*". This means that the law does not require any energy storage procurements or installations if such were determined not to be cost-effective.

Consistent with the AB 2514 requirement, in 2012 the Board authorized Staff to engage in a process to determine whether energy storage technologies and applications exist that might be cost-effective in the context of Azusa Light & Water's electric utility resource portfolio, resource management, operations, or otherwise needs.

Since Azusa does not directly own, operate or control any transmission assets and there are already a number of existing thermal storage installations on the customer side ("behind the meter") installed/subsidized by Azusa under SB 1 and other programs, Staff focused on potential distribution system opportunities. Accordingly, upon review of distribution system needs, Staff identified a potential storage application opportunity at City of Azusa's Kirkwall Substation. Kirkwall Substation serves about 25% of Azusa's load, mainly south of the 210 Freeway. The Kirkwall Substation currently can serve up to approximately 16 MW load (continuous), when two identical 8 MVA 66kV/12kV transformers are operated in parallel. Currently, the summer peak load at Kirkwall Substation runs in the 12 MW to 17 MW range. However, as the load served by this substation grows, Azusa may be faced with the prospect of having to upgrade the existing transformer banks. Properly sized and operated energy storage devices can 1) offer a cheaper alternative to serve peak demands exceeding 16 MVA on non-continuous basis, and 2) arguably defer the time at which continuous operation above 16 MVA would require transformer upgrades. Additionally, such energy storage devices(s) could serve as short duration back-up power for loads stranded during forced Kirkwall outages and/or before such loads are transferred to another City owned substation.

Study Approach

Azusa staff established that a theoretical 5 MW (20 MWH energy capacity) device would be a "good-fit size-wise" for such potential application. The "good fit-size-wise" refers to both the 5 MW capacity/20 MWH energy sizing as well as to the available physical space at Kirkwall property (one should note a typical 1 MW battery is the size of an average truck hauler container). Staff elected to model two cases of energy storage and chose NaS (Sodium Sulfur) and Li-ion (Lithium ion) batteries because of relative maturity of the technologies and extensive performance track record of similar storage devices.

Azusa and several other Southern California POUs commissioned Navigant Consulting to develop an energy storage valuation tool and provide assistance in using the tool to model the economic benefits of siting the above discussed storage.

Navigant created a framework and decision making tool for identifying, quantifying, and monetizing benefits of energy storage projects. In the framework, potential benefits are realized differently depending on the system characteristics (e.g., location on the grid or distribution, pertinent regulatory structure, and owner). The benefits are realized by using energy storage in four main categories - load leveling, grid operational support, grid stabilization, and distribution applications. Within these categories, each application of energy storage can lead to different economic, reliability, and environmental benefits.

The decision making tool is based in Microsoft Excel and takes a variety of inputs. The user first enters the project location, owner, regulatory environment and technology type. Next, the user enters cost and performance information such as installed cost, operation and maintenance costs, round trip efficiency and cycle life. Then the user selects which applications to analyze. Based upon the applications selected, the user is prompted to enter inputs to help calculate benefits, such as the amount of energy storage dispatched by application, market prices and rates structures. Finally, the user has the option of selecting to run various scenarios. After inputting all the necessary information, the tool presents the net present costs and benefits of the project.

The tool has gone through extensive review and usage. Sandia National Labs and the US Department of Energy (DOE) conducted formal peer reviews of the framework. The DOE has adopted this framework for use by 16 recipients of the Smart Grid Demonstration program and the framework has been presented at numerous energy storage conferences. In addition, it is similar to a Smart Grid framework that we have acquired which has been reviewed by dozens of utilities and thought leaders as part of our work for the DOE on the Smart Grid Investment Grant program.

The modeling itself was performed by Azusa personnel using the above Navigant-developed tool and with assistance from Navigant's analysts.

The following are Staff's key thoughts and findings on applicability of various energy storage technologies as well as conclusions from model runs for a potential opportunity of siting an energy storage device at Kirkwall Substation:

1) In general, energy storage technologies are poised to provide viable alternatives in some aspects of electric utility applications
2) **Presently** available storage technologies are still mostly uneconomic for general electric utility operations [there are exceptions however, precipitating primarily from extreme operational demand – remote/isolated locations (islands or deserts) as well as various policy/regulatory mandates]
3) Various industry and scientific reports point to well pronounced downward trends in the costs of various energy storage technologies and devices
4) As various energy storage technologies improve from the efficiency, safety and reliability perspective and their costs continue to decline, various energy storage devices technologies may become economic to install and operate
5) Current Energy Storage impediments:
    a. Cost
    b. Technology performance limitations (# of cycles, depth of discharge)

c. Reliability
d. Control
e. Durability
f. Safety
g. Space requirements (location)
h. Effective integration and control

<u>Results of the Model Runs</u>

As stated above, Staff investigated the costs & benefits of installing two operationally feasible battery technologies (one at a time) – with capacity of 5 MW and discharge duration of 4 hours (20 MWh energy capacity) in lieu of a Kirkwall transformer upgrade. The results were as follows:

- Using a NaS (Sodium Sulfur) battery would be $18,651,000 more expensive than traditional approach of transformation upgrades (i.e. adding transformers at an estimated cost of $3,000,000 plus $60,000 annual O&M).

- Using a Li-ion (Lithium ion) battery would be $16,091,000 more expensive than traditional approach of transformation upgrades (I.e. adding transformers at an estimated cost of $3,000,000 plus $60,000 annual O&M).

<u>Conclusion and Recommendation</u>

In light of all of the above and performed modeling, Staff concludes that, at this time, no available energy storage technologies are offered at the acceptable price (i.e. they are still uneconomic) for the studied (and at this time the only known) potential Azusa application. **Accordingly, Staff recommends that the Board adopt by resolution no targets for energy storage installations on Azusa owned, operated, or controlled system for Dec 31, 2016 and December 31, 2021.**

<u>FISCAL IMPACT</u>

There is no fiscal impact at the present time.

Prepared by: Yarek Lehr, Assistant Director of Resource Management
Federico Langit, Jr., Assistant Director of Electric Operations

Attachment: Resolution No. UB-12-14